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Dissociation of energy-selected CH3F+ ions studied with double imaging photoelectron-photon coincidence

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The dissociation of halogenated methane ions in different electronic states is interesting since it usually undergoes specific reactions to different products. Presently we are focusing on methyl fluoride ion CH3F+, the lightest halogenated methane, which should exhibit specific dissociation dynamics too.
We will present a detailed study of the photoionization and dissociative photoionization of methyl fluoride obtained with the double imaging photoelectron photoion coincidence (PEPICO) spectrometer, DELICIOUS III, [1] permanently installed on the DESIRS vacuum ultraviolet (VUV) beamline [2] at SOLEIL Synchrotron, France. For example, threshold photoelectron spectrum (TPES) in the energy range of 12.2-19.8 eV has been recorded and is presented in Figure 1. The X2E, A2A1 and B2E electronic states are covered, with the A2A1 and B2E excited sates overlapping and lacking structure.
The mass-selected threshold PEPICO spectra of CH3F+, CH2F+, CHF+, CH3+ and CH2+ ions are also presented in Figure 1. It is shown that the dissociation of CH3F+ ions in different electronic states can be specific, even outside the Franck-Condon region. Based on the obtained electron and ion kinetic energy correlation diagram, such as the one shown in Figure 2, the detailed dissociation mechanism of energy-selected CH3F+ ions will be revealed.

Figure 1. (a) TPES and (b) mass-selected threshold PEPICO spectra in the energy range of 12.2-19.8 eV.

Figure 2. Electron and ion kinetic energy correlation of CH3+ fragments at photon energy of 19.8 eV.

References

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